

SN 10/646,378  
Docket No. S-94,729  
In Response to Office Action dated April 6, 2006

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AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS:

1. (Currently amended) A functionalized polymer for binding a solute or a suite of solutes dissolved in a solution comprising:

a polymeric backbone, wherein the polymeric backbone is selected from the group consisting of polyvinylamine, polyallylamine, polyacrylamide, polyethylenimine, polyacrylic acid, polymethacrylic acid, polyvinylalcohol, polyvinylacetate, and polypyrrol; and

one or more functional groups covalently linked to the polymeric backbone, the one or more functional groups selected to bind to the solute or a suite of solutes, the one or more functional groups selected from the group consisting of a ~~monol~~ monool derivative, a diol derivative, a triol derivative, a tetraol derivative, a glucarone derivative, a thiol derivative, a dithiol derivative, an alpha-hydroxycarboxylic acid derivative, a tartrate derivative, a calixarene derivative, a polypeptide derivative, bisphosphonic acid derivatives, biscarboxylic acid derivatives and bisamide derivatives, bisester derivatives, a monoester derivative, a monoamide derivative, a mixed phosphonic acid/carboxylic acid derivative, an alkylpyridinium derivative, a cyclodextran derivative, an antibody, a Fab fragment of an antibody, a F(ab)<sub>2</sub> of an antibody, an antigen, a cavity of selected size that hosts the solute selectively, a cage-shaped host, guest-host groups, and affinity groups, wherein the functionalized polymer is bindable-binds to a neutral metalloid or non-metallic solute or a suite of metalloid or non-metallic solutes by one of inclusion and ester or thioester formation.

2. (Original) The functionalized polymer of claim 1, wherein the polymeric backbone is ~~selected from the group consisting of polyvinylamine, polyallylamine, polyacrylamide, polyethylenimine, polyacrylic acid, polymethacrylic acid, polyvinylalcohol, polyvinylacetate, polypyrrol, and hyperbranched polymers~~ and wherein the one or more functional groups is selected from the group consisting of a monool derivative, a diol derivative, and a tartrate derivative.

3. (Currently amended) The functionalized polymer of claim 12, wherein the diol derivative is tartrate.

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4. (Currently amended) The functionalized polymer of claim 3, wherein the tartrate is covalently linked to the polymeric backbone to ~~from~~ form a cyclic tartrate imide.

5. (Original) The functionalized polymer of claim 3, wherein the tartrate is covalently linked to the 5 polymeric backbone to form an open monoester, which can be converted to a carboxylic acid.

6. (Original) The functionalized polymer of claim 3, wherein the tartrate is covalently linked to the polymeric backbone to form a diamide attached to two different nitrogen atoms of the polymeric backbone.

7. (Original) The functionalized polymer of claim 1, wherein the diol derivative is glycidol.

8. (Original) The functionalized polymer of claim 1, wherein the functionalized polymer is crosslinked thereby rendering the functionalized polymer insoluble in water.

9. (Original) The functionalized polymer of claim 1, wherein the functionalized polymer is water-soluble.

10. (Original) The functionalized polymer of claim 9, wherein the functionalized polymer is purified to have polymer molecule sizes capable of being retained by a membrane with a molecular weight cutoff value of a first pre-selected level and essentially free of polymer molecule sizes capable of passing through a membrane with a molecular weight cutoff value of a second pre-selected level the second pre-selected level being smaller than the first pre-selected level.

11. (Previously presented) The functionalized polymer of claim 10, wherein the functionalized polymer has a molecular weight in the range from about 1,000 MW to about 1,000,000 MW.

12. (Previously presented) The functionalized polymer of claim 10, wherein the functionalized polymer has a molecular weight in the range from about 10,000 MW to about 100,000 MW.

13. (Currently amended) The functionalized polymer of claim 1, wherein the functionalized polymer is represented by the formula X-R wherein "X" is a synthetic polymer selected from the group consisting of polyethylenimine, polyvinylamine, polyallylamine, polypropylamine polyacrylamide, polyethylenimine, polyacrylic acid, polymethacrylic acid, polyvinylalcohol, polyvinylacetate, or polypyrrol, ~~or hyperbranched polymers~~ and "R" is a functional group selected from the group consisting of a monool derivative, a diol derivative, a

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tetraol derivative, a triol derivative, an alphahydroxycarboxylate derivative, a glucarone derivative, and a dithiol derivative.

14. (Original) The functionalized polymer of claim 13, wherein the polymer is water soluble.

15. (Original) The functionalized polymer of claim 14, wherein the functionalized polymer is purified to have polymer molecule sizes capable of being retained by a membrane with a molecular weight cutoff value of a first pre-selected level and essentially free of polymer molecule sizes capable of passing through a membrane with a molecular weight cutoff value of a second pre-selected level the second pre-selected level being smaller than the first pre-selected level.

16. (Previously presented) The functionalized polymer of claim 14, wherein the functionalized polymer has a molecular weight in the range from about 1,000 MW to about 1,000,000 MW.

17. (Currently amended) The functionalized polymer of claim 14, wherein the functionalized polymer has a ~~5~~-molecular weight in the range from about 10,000 MW to about 100,000 MW.

18. (Currently amended) The functionalized polymer of claim 13, wherein the metalloid or non-metallic solute or suite of metalloid or non-metallic solutes is selected from the group consisting of species of arsenic, boron, silicon, and antimony.

19. (Currently amended) The functionalized polymer of claim 1, wherein the functionalized polymer is represented by the formula X-R, wherein "X" is a synthetic polymer selected from the group consisting of polyethylenimine, polyvinylamine, polyallylamine, polypropylamine, polyacrylamide, polyethylenimine, polyacrylic acid, polymethacrylic acid, polyvinylalcohol, polyvinylacetate, or polypyrrol, ~~or hyperbranched polymers~~ and "R" is a functional group selected from the group consisting of a thiol derivative, a tartrate derivative, a calixarene derivative, a polypeptide derivative, bisphosphonic acid derivatives, biscarboxylic acid derivatives and bisamide derivatives, bisester derivatives, a monoester derivative, a monoamide derivative, a mixed phosphonic acid/carboxylic acid derivative, an alkylpyridinium derivative, a cyclodextran derivative, an antibody, a Fab fragment of an antibody, a F(ab)<sub>2</sub> of an antibody, an antigen, a cavity of selected size that hosts the solute selectively, a cage-shaped host, guest-host groups, and affinity groups.

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20. (Original) The functionalized polymer of claim 19, wherein the polymer is water soluble.

21. (Original) The functionalized polymer of claim 20, wherein the functionalized polymer is purified to have polymer molecule sizes capable of being retained by a membrane with a molecular weight cutoff value of a first pre-selected level and essentially free of polymer molecule sizes capable of passing through a membrane with a molecular weight cutoff value of a second pre-selected level the second pre-selected level being smaller than the first pre-selected level.

22. (Currently amended) The functionalized polymer of claim 20, wherein the functionalized polymer has a ~~10~~-molecular weight in the range from about 1,000 MW to about 1,000,000 MW.

23. (Previously presented) The functionalized polymer of claim 20, wherein the functionalized polymer has a molecular weight in the range from about 10,000 MW to about 100,000 MW.

24. (Currently amended) The functionalized polymer of claim 19, wherein the metalloid or non-metallic solute or suite of metalloid or non-metallic solutes is selected from the group consisting of species of arsenic, boron, silicon, and antimony.

25. (Currently amended) The functionalized polymer of claim 1, wherein the metalloid or non-metallic solute or suite of metalloid or non-metallic solutes is selected from the group consisting of arsenic, ~~barium, cadmium, chromium, mercury, lead, silver, selenium, actinides, lanthanides, eopper, nickel, zinc, cobalt,~~ boron, silicon, iodine, and antimony.

26. (Currently amended) A functionalized synthetic polymer for binding a solute or a suite of solutes dissolved in a solution comprising:

a water-soluble backbone polymer selected from the group consisting of polyethylenimine, polyvinylamine, polyallylamine, polypropylamine polyacrylamide, polyethylenimine, polyacrylic acid, polymethacrylic acid, polyvinylalcohol, polyvinylacetate, or polypyrrol, ~~or hyperbranched polymers;~~ and

one or more functional groups covalently linked to the polymeric backbone, the one or more functional groups selected to bind to the solute or a suite of solutes, the one or more functional groups selected from the group consisting of a ~~monol~~-monool derivative, a diol derivative, ~~a thol derivative, a tetraol derivative, a glucarone derivative, and~~ a thiol derivative, ~~a dithiol derivative, an alpha-hydroxycarboxylic acid derivative, a tartrate derivative, a calixarene~~

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~~derivative, a polypeptide derivative, bisphosphonic acid derivatives, biscalboxylic acid derivatives and bisamide derivatives, bisester derivatives, a monoester derivative, a monoamide derivative, a mixed phosphonic acid/carboxylic acid derivative, an alkylpyridinium derivative, a cyclodextran derivative, an antibody, a Fab fragment of an antibody, a F(ab)<sub>2</sub> of an antibody, an antigen, a cavity of selected size that hosts the solute selectively, a cage-shaped host, guest host groups, and affinity groups, the functionalized polymer being purified to have polymer molecule sizes capable of being retained by a membrane with a molecular weight cutoff value of a first pre-selected level and essentially free of polymer molecule sizes capable of passing through a membrane with a molecular weight cutoff value of a second pre-selected level the second pre-selected level being smaller than the first pre-selected level, wherein the functionalized polymer is bindable binds to a neutral metalloid or non-metallic solute or a suite of metalloid or non-metallic solutes by one of inclusion and ester or thioester formation.~~

27. (Original) The functionalized polymer of claim 26, wherein the diol derivative is tartrate.

28. (Currently amended) The functionalized polymer of claim 27, wherein the tartrate is covalently linked to the polymeric backbone to ~~from form~~ a cyclic tartrate imide.

29. (Original) The functionalized polymer of claim 27, wherein the tartrate is covalently linked to the polymeric backbone to form an open monoester.

30. (Original) The functionalized polymer of claim 27, wherein the tartrate is covalently linked to the polymeric backbone to form a diamide attached to two different nitrogen atoms of the polymeric 10 backbone.

31. (Previously presented) The functionalized polymer of claim 26, wherein the functionalized polymer has a molecular weight in the range from about 1,000 MW to about 1,000,000 MW.

32. (Previously presented) The functionalized polymer of claim 26, wherein the functionalized polymer has a molecular weight in the range from about 10,000 MW to about 100,000 MW.

33. (Currently amended) The functionalized polymer of claim 32, wherein the ~~the metalloid or~~ non-metallic solute or suite of non-metallic solutes is selected from the group consisting of species of arsenic, boron, silicon, and antimony.

34. (Previously presented) The functionalized polymer of claim 26, wherein the solute or

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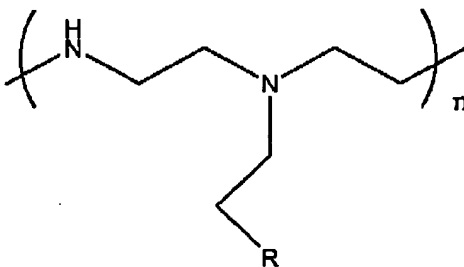
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suite of solutes is selected from the group consisting of arsenic, barium, boron, silicon, iodine, and antimony.

35. (Currently amended) The functionalized synthetic polymer of claim 126, wherein the functionalized polymer is represented by the formula X-R wherein "X" is a polymer selected from the group consisting of polyethylenimine, polyvinylamine, polyallylamine, polypropylamine, polyacrylamide, polyethylenimine, polyacrylic acid, polymethacrylic acid, polyvinylalcohol, polyvinylacetate, or polypyrrol, ~~or hyperbranched polymer~~ and "R" is a functional group selected from the group consisting of a ~~monol-monool~~ derivative, a diol derivative, a ~~thol~~ derivative, a ~~tetraol~~ derivative, a ~~glucarone~~ derivative, and a thiol derivative, a ~~dithiol~~ derivative, an ~~alpha-hydroxycarboxylic acid~~ derivative, a tartrate derivative, a ~~calixarene~~ derivative, a ~~polypeptide~~ derivative, ~~bisphosphonic acid~~ derivatives, ~~biscarboxylic acid~~ derivatives and ~~bisamide~~ derivatives, ~~bisester~~ derivatives, a ~~monoester~~ derivative, a ~~monoamide~~ derivative, a ~~mixed phosphonic acid/carboxylic acid~~ derivative, an ~~alkylpyridinium~~ derivative, a ~~cyclodextran~~ derivative, an ~~antibody~~, a Fab fragment of an ~~antibody~~, a ~~F(ab)2~~ of an ~~antibody~~, an ~~antigen~~, a cavity of selected size that hosts the solute selectively, a ~~cage-shaped host~~, ~~guest host~~ groups, and ~~affinity~~ groups.

36. (Currently amended) A functionalized polymer for binding a solute or a suite of solutes dissolved in a solution, the functionalized polymer comprising a molecule of the formula:



wherein n is an integer between about 12 and about 12,000 and R is NH<sub>2</sub> except at one or more positions within the polymer where R is a functional group independently selected from the group consisting of a ~~monol-monool~~ derivative, a diol derivative, a ~~thol~~ derivative, a ~~tetraol~~ derivative, a ~~glucarone~~ derivative, and a thiol derivative, a ~~dithiol~~ derivative, an ~~alpha-hydroxycarboxylic acid~~ derivative, a tartrate derivative, a ~~calixarene~~ derivative, a ~~polypeptide~~ derivative, ~~bisphosphonic acid~~

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~~derivatives, biscarboxylic acid derivatives and bisamide derivatives, bisester derivatives, a monoester derivative, a monoamide derivative, a mixed phosphonic acid/carboxylic acid derivative, an alkylpyridinium derivative, a cyclodextran derivative, an antibody, a Fab fragment of an antibody, a F(ab)2 of an antibody, an antigen, a cavity of selected size that hosts the solute selectively, a cage-shaped host, guest host groups, and affinity groups, wherein the functionalized polymer is bindable binds to a neutral metalloid or non-metallic solute or a suite of metalloid or non-metallic solutes by one of inclusion and ester or thioester formation.~~

37. (Original) The functionalized polymer of claim 36, wherein the functionalized polymer is crosslinked thereby rendering the functionalized polymer insoluble in water.

38. (Original) The functionalized polymer of claim 36, wherein the functionalized polymer is water-soluble.

39. (Original) The functionalized polymer of claim 38, wherein the functionalized polymer is purified to 20 have polymer molecule sizes capable of being retained by a membrane with a molecular weight cutoff value of a first pre-selected level and essentially free of polymer molecule sizes capable of passing through a membrane with a molecular weight cutoff value of a second pre-selected level the second pre-selected level being smaller than the first pre-selected level.

40. (Previously presented) The functionalized polymer of claim 39, wherein the functionalized polymer has a molecular weight in the range from about 1,000 MW to about 1,000,000 MW.

41. (Previously presented) The functionalized polymer of claim 39, wherein the functionalized polymer has a molecular weight in the range from about 10,000 MW to about 100,000 MW.

42. (Currently amended) The functionalized polymer of claim 39, wherein ~~the~~ the metalloid or non-metallic solute or suite of metalloid or non-metallic solutes is selected from the group consisting of species of arsenic, boron, silicon, and antimony.

43. (Previously presented) The functionalized polymer of claim 36, wherein the solute or suite of solutes is selected from the group consisting of arsenic, boron, silicon, iodine, and antimony.